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Phoma candelariellae sp. nov., a lichenicolous fungus from Turkey

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Abstract — *Phoma candelariellae* is described from the apothecia of *Candelariella aurella* in the Central Anatolia region of Turkey. The new species is distinguished among the lichenicolous *Phoma* species by its clustered conidiomata arising in groups and its subglobose conidia. It is also the first *Phoma* species reported on *Candelariella*.

Key words — biodiversity, coelomycetes, mitosporic fungi, *Phaeosphaeriaceae*, *Dothideomycetes*

Introduction

Phoma Sacc. is a large fungus genus with approximately 220 species, most of which are plant pathogens, endophytes, or saprophytes (Boerema et al. 2004). Twenty-four species in this genus, however, are obligately lichenicolous (Hawksworth 1981, Hawksworth & Cole 2004, Diederich et al. 2007, Brackel 2008, Kondratyuk et al. 2010, Lawrey et al. 2012, Halıcı et al. 2014). Keys to lichenicolous *Phoma* species have been provided by Hawksworth (1981), Hawksworth & Cole (2004), and Diederich et al. (2007). Recent molecular analyses place the genus in the *Phaeosphaeriaceae*, *Pleosporales*, *Dothideomycetes* (Lawrey et al. 2012).

Halıcı (2008) published a key to the lichenicolous fungi of Turkey covering 117 taxa. Of the 190 lichenicolous species reported from Turkey (Halıcı et al. 2012, 2014), only three lichenicolous *Phoma* species have been reported: *P. peltigerae* (P. Karst.) D. Hawksw. on *Peltigera* spp. (Candan et al. 2010; Halıcı et al. 2012); *P. caloplacae* D. Hawksw. [≡ *Diederichomyces caloplacae*; Trakunyingcharoen et al. 2014] on the apothecia of *Caloplaca stillicidiorum* (Hawksworth 1981); and *P. recepii* Halıcı & Candan on the apothecia of *Caloplaca cerina* and *C. monacensis*

(Halıcı et al. 2014). A new species, described here as *P. candelariellae*, represents the fourth lichenicolous *Phoma* species from Turkey.

Material & methods

The holotype and paratype specimens of the new species are deposited in Erciyes University Herbarium Kayseri, Turkey (ERC). Sections were prepared by hand and examined in I [Lugol's iodine (Merck 9261) with (KI) and without (I) pre-treatment with 10% KOH], 10% KOH, cotton blue, and water. Conidia and pycnidia were measured in water; measurements are presented as (min–) X–sd – *X* – X+sd (–max), where 'min' and 'max' represent the extreme values, 'X' the arithmetic mean, and 'sd' the standard deviation. The microphotographs were taken with a Leica DFC 420 digital microscope camera with a c-mount interface and a 5 megapixel CCD.

Taxonomy

Phoma candelariellae Z. Kocakaya & Halıcı, **sp. nov.** Figure 1

MycoBank MB 812271

Differs from all other lichenicolous *Phoma* species by its combination of clustered conidiomata arising in groups, subglobose conidia, and host genus *Candelariella*.

Type: Turkey, Eskişehir, Sivrihisar, northwest of Sivrihisar, 39°27′16″N 31°31′36″E, alt. 1260 m, on apothecia of *Candelariella aurella* (Hoffm.) Zahlbr., 22 July 2012, M.G. Halıcı MGH3.274 (**Holotype,** EUH).

Etymology: The epithet refers to the host lichen genus *Candelariella*.

Conidiomata pycnidial, arising in groups on the apothecia of the host lichen (*Candelariella aurella*), at first more or less immersed but at maturity becoming partially erumpent, clustered, black in macroscopic view, in section pale golden brown in lower parts and dark brown in the upper parts, covered by a hyaline gelatinous sheath, subglobose to almost globose, (72–)80–*98.5*–117(–129) × (69–)74–*89*–103(–111) µm (n = 20), ostiolate, ostiole c. 12 µm diam.; pycnidial wall 9–14 µm thick, composed of 2–5 layers of pseudoparenchymatous cells, mainly polyhedral but some globose, outer cells dark brown, about 4–6 × 6–7 µm, inner ones paler, 4–7 µm wide. Cells near the ostiole have a darker brownish tinge. Conidiogenous cells lining the inner wall of the pycnidial cavity, short ampulliform to subglobose, hyaline, smooth-walled, 4–7 × 3–5 µm, conidiogenesis enteroblastic. Conidia abundantly produced, arising singly, subglobose to globose, hyaline, generally 1-guttulate, sometimes one additional small guttule present, simple, smooth-walled, with a gelatinous sheath, (3.5–)4.5–*5*–5.5(–6) × (3–)3.5–*3.9*–4.5(–5.4) µm; l/b = (0.9–)1.1–*1.3*–1.5(–1.7) (n = 100).

Additional specimen examined: **TURKEY, Kütahya**, Ilıca, north of Yazlıca Village, 39°36′41″N 30°03′03″E, alt. 1050 m, on apothecia of *Candelariella aurella*, 29 June 2012, M.G. Halıcı MGH3.331 (EUH).

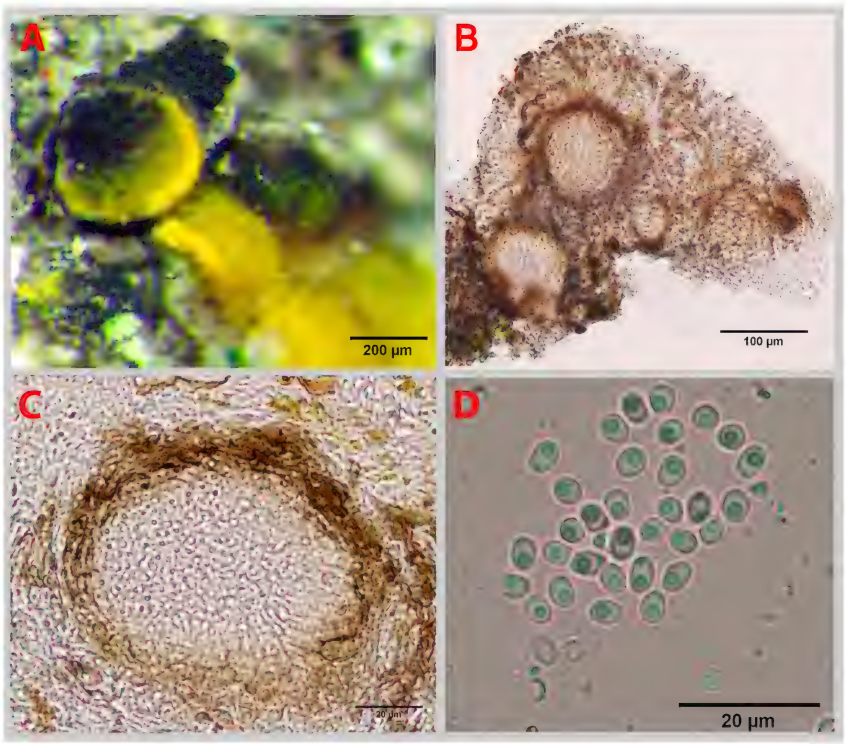

Fig. 1. *Phoma candelariellae* (holotype, ERC MGH 3.274): A, infected apothecial discs of the host lichen, *Candelariella aurella*, showing conidiomata arising in groups; B, conidiomata in the hymenium of the host; C, closer view of a conidioma; D, conidia.

Ecology & distribution: *Phoma candelariellae* is currently known from only two localities in the northwest part of the Central Anatolia Region, Turkey, on the apothecia of *Candelariella aurella* on calcareous rocks at an 1000–1300 m elevation. As the host lichen occurs on calcareous rocks throughout the northern hemisphere, *P. candelariellae* may have a potentially much wider distribution. The species seems to be pathogenic, as the infected apothecial discs of the host discolour and become blackish; ascospore production is apparently inhibited in the infected parts of the hymenium, until eventually the entire hymenium of an infected apothecium is destroyed.

Notes: *Phoma candelariellae* is the only *Phoma* species known to grow on *Candelariella*. Among the previously described lichenicolous *Phoma* species, only *P. caloplacae*, *P. lobariae* Diederich & Etayo, *P. puncteliae* Diederich

Table 1. Comparison of lichenicolous *Phoma* species with subglobose conidia

Species	Conidiomata (µm)	Conidiogenous cells (µm)	Conidia (µm)	Reference
P. caloplacae	50–130	5–6	4–7	Hawksworth (1981)
P. candelariellae	72–129 × 69–111	4–7 × 3–5	3.5–6 × 3–5.4	This paper
P. lobariae	50–100	4–6 × 1.7–3.5	3–4 × 2.5–3	Etayo & Diederich (1995)
P. physciicola	100–150	4–7	4–6 × 2.5–4	Hawksworth (1981)
P. puncteliae	40–60	2.5–5 × 3.5–4.5	2.5–3 × 2–2.4	Lawrey et al. (2012)

& Lawrey [≡ *Xenophoma puncteliae*; Trakunyingcharoen et al. 2014], and *P. physciicola* Keissl. have subglobose conidia. These species all grow on different lichen hosts and differ from *P. candelariellae* in various morphological characters (Table 1). *Phoma caloplacae* differs from *P. candelariellae* by its conidiomata arising singly in the host apothecia and its slightly larger conidia (Hawksworth 1981, Halıcı et al. 2014). *Phoma lobariae*, described on the older parts of the thallus of *Lobaria pulmonaria*, also has conidiomata arising singly and slightly smaller conidia and conidiomata (Etayo & Diederich 1995). *Phoma physciicola*, reported on *Physciaceae*, *Parmeliaceae*, and *Baeomyces rufus*, produces conidiomata that sometimes arise in small groups on the apothecia or thalli of the host lichens but is distinguished by its more ellipsoid conidia (Keissler 1911, Hawksworth 1981, Diederich et al. 2007). *Phoma puncteliae*, growing on the thalli of *Punctelia rudecta*, has obviously smaller conidia and conidiomata (Lawrey et al. 2012).

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